

Notice of Allowability

Application No.

10/559,980

Examiner

Reema Patel

Applicant(s)

KOUVETAKIS ET AL.

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 12/08/05.
2. ☒ The allowed claim(s) is/are 1-25.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date 12/20/06
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) was submitted on 12/20/06. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement has been considered by the examiner.

Allowable Subject Matter

2. Claims 1-25 are allowed.

3. The following is an examiner's statement of reasons for allowance: The prior art of record and to the examiner's knowledge does not teach or render obvious, at least to the skilled artisan, the instant invention regarding:

- As to claim 1, the method of forming $E(\text{GeH}_3)_3$, wherein E is selected from the group consisting of arsenic (As), antimony (Sb), and phosphorous (P), by combining GeH_3Br with $[(\text{CH}_3)_3\text{Si}]E$. Claims 2-4 depend on claim 1.
- As to claim 5, the method of forming $E(\text{GeH}_3)_3$, wherein E is selected from the group consisting of arsenic, antimony, and phosphorous, by combining GeH_3Br with $[(\text{CH}_3)_3\text{Si}]E$ according to the formula: $3\text{GeH}_3\text{Br} + [(\text{CH}_3)_3\text{Si}]E \rightarrow 3(\text{CH}_3)_3\text{SiBr} + E(\text{GeH}_3)_3$. Claims 6-8 depend on claim 5.
- As to claim 9, a method for doping a region of a semiconductor using a gaseous precursor having the formula $E(\text{GeH}_3)_3$, wherein E is selected from the group consisting of arsenic, antimony, and phosphorous. Claims 10-13 depend on claim 9.

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- As to claim 14, a method for depositing a doped epitaxial Ge-Sn layer on a substrate in a chemical vapor deposition reaction chamber, the method comprising introducing into the chamber a gaseous precursor comprising SnD_4 mixed in H_2 under conditions whereby the epitaxial Ge-Sn layer is formed on the substrate; and introducing into the chamber a gaseous precursor having the formula $\text{E}(\text{GeH}_3)_3$, wherein E is selected from the group consisting of arsenic (As), antimony (Sb), and phosphorous (P). Claims 15-18 depend on claim 14.
- As to claim 19, a method for forming a Group IV semiconductor film, the method comprising forming a Group IV semiconductor film by chemical vapor deposition, wherein the Group IV semiconductor film is doped with impurities comprising an element E at a concentration of 10^{21} atoms/cm³ to about several percent using a precursor having the formula $\text{E}(\text{GeH}_3)_3$, wherein E is selected from the group consisting of arsenic (As), phosphorous (P) and antimony (Sb).
- As to claim 20, a method for forming a Group IV semiconductor film, the method comprising forming the Group IV semiconductor film by a chemical vapor deposition method and; while forming the Group IV semiconductor film, doping the film with impurities comprising an element E at a concentration ranging from about 10^{21} atoms/cm³ to about 3 atomic % using a precursor having the formula $\text{E}(\text{GeH}_3)_3$, wherein E is selected from the group consisting of arsenic (As), antimony (Sb), and phosphorous (P). Claims 21-22 depend on claim 20.
- As to claim 23, a method of preparing $(\text{E})\text{H}_x(\text{GeH}_3)_{3-x}$, where $x=1$ or 2 and E is selected from the group consisting of phosphorous (P), arsenic (As), or antimony

(Sb), by reacting inorganic or organometallic compounds of the E element with an alkali germyl or halogenated germane. Claims 24-25 depend on claim 23.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Reema Patel whose telephone number is 571-270-1436. The examiner can normally be reached on M-F, 8:00-4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RSP
3/15/07

SCOTT B. GEYER
PRIMARY EXAMINER

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